UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/710,235	06/28/2004	Chun-Liang Tai	LKSP0035USA	4234

27765 7590 01/02/2008

NORTH AMERICA INTELLECTUAL PROPERTY CORPORATION
P.O. BOX 506
MERRIFIELD, VA 22116

EXAMINER
GAKH, YELENA G

ART UNIT	PAPER NUMBER
1797	

NOTIFICATION DATE	DELIVERY MODE
01/02/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

winstonhsu.uspto@gmail.com
Patent.admin.uspto.Rcv@naipo.com
mis.ap.uspto@naipo.com.tw

Office Action Summary	Application No.	Applicant(s)	
	10/710,235	TAI ET AL.	
	Examiner	Art Unit	
	Yelena G. Gakh, Ph.D.	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 June 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 1-11 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification does not provide any detailed explanation for the processes occurring in the system, which is necessary for performing the method, and is accompanied with black and white artifacts, which are non-descriptive. If the Applicants observed changes in color of tungsten metal film under conditions disclosed in the specification, such changes could be caused by totally different factors, than those disclosed in the specification; the claimed method contradicts the well known prior art on using tungsten as oxygen sensor and on its physical-chemical properties, including color changes in the system upon reaction with oxygen. In other words, what is observed as color changes may be totally unrelated to oxygen leakage, which makes the invention un-enabled. The prior art discloses the following:

Shigeishi teaches "a field ion investigation of oxygen on tungsten":

> "the oxygen-tungsten system has been extensively studied for many years and recently, much new information as been obtained in surface structure, work function changes, surface diffusion, adsorption states, and kinetics of oxide formation by a variety of techniques including Leed, electron desorpion spectrometry, flash desorption, and filed emission microscopy. Recent reviews by McCarroll (1) and Musket (2) summarize these findings and hence need not be repeated here. There are, however, comparatively few reports of the systematic investigation of the tungsten-oxygen system at elevated temperatures by means of filed ion spectroscopy (3). It is now generally recognized that oxygen atoms on tungsten cannot be imaged since they are either field desorbed from the surface before imaging voltages are reached or else are buried within the surface (4). Nevertheless, it is also known that when oxygen is chemisorbed, tungsten-tungsten bonds are weakened with the result that in field desorption, both oxygen and an adjacent tungsten atom are stripped off together in the form of tungsten oxide molecular ions. Müller and co-worker's initial atom probe studies (5) have shown that these ions are WO^{3+}, WO_2^{3+}, WO_3^{3+}.

> Thus the combination of chemisorption and field desorption results in an "etched" surface and from a comparison of the images of clean and etched surfaces the position of the oxygen can be inferred. Filed ion microscopy should therefore be valuable in studying among other things, surface diffusion, preferential adsorption, and penetration of adsorbate into the substrate" (page 997, left and right column).

Bloomer et al. disclose

> "a simple detector for small leaks using a thoriated tungsten emitter with oxygen as probe gas" and emphasize that "thoriated tungsten filaments are very sensitive to such gases [as oxygen] and can be used in a leak detection method, applicable to well-baked high vacuum systems, in which oxygen is used as a probe or jacket gas, replacing air entering through any remaining leaks. .... The condition, or sensitivity, of the leak detector is conveniently defined by the fractional change I_e/I_e in the emission current Ie from the filament" (page 306, right paragraph).

JP 11339935 A discloses a "ceramic heater for oxygen concentration sensor [that] includes heat resistor which consists of rhenium and tungsten in specific proportions" (DERWENT Title) and is based on detecting changes in electrical resistance.
None of the cited references teach color changing of tungsten upon its interaction with oxygen.

The examiner found a reference that does disclose two colors related to tungsten, Bussjager et al. "A spinning disk test stand for two-color, tungsten oxide based optical memory system". However, the colors are related to two forms of tungsten oxides: WO_3 and W_2O_5. Bussjager indicates:

> "the electrochromic and photochromic properties of the tungsten oxide system has been well known [19] for over 30 years. WO_3 is a yellow ["gold"] material that is slightly semiconducting and represents the lowest energy form of tungsten in contact with molecular gas phase oxygen. It exists as a monoclinical solid [20] from room temperatures to approximately 300°-400° C. A first order phase transition to an orthorhombic form occurs in this temperature range, and very little evaporation of tungsten in any form occurs below 300°-400° C. Exchange of oxygen both within the lattice and between the solid and surrounding gas phase is well known [21]. The surface region of the material can be manipulated so that it is either more or less oxygen deficient with respect to stoichiometric WO_3. **Oxygen deficiency leads to W^{+5} centers and the changing of the color of the material from yellow to blue**. Concurrent with the color change, electrical properties, e.g. electrical resistance, change by orders of magnitude [22], [23]. The change in the color from yellow to blue in the WO_3 and W_2O_5 system, respectively, is indicative of a change in index of refraction. This change can be purely photochromic or electrochromic" (pages 330-331, Chapter 2. The WO_3 and W_2O_5 system"). According to both mechanisms tungsten oxide loses oxygen.

Furthermore, according to Wikipedia, "pure tungsten is steel-gray to tin-white and is a hard metal".

Therefore, the claimed method contradicts disclosure of the prior art and the known properties of the claimed compounds; at least the examiner failed to find any reference which indicates that tungsten metal is of a golden color. Moreover, changing the color from yellow ("gold") to blue is related to tungsten oxides, rather than tungsten metal, and is caused by loss of oxygen, rather than its gain.

The Applicants are requested to provide more detailed experimental results along with evidence that they observe changes of tungsten film from gold to blue or green, as disclosed in the specification, which occurs upon exposing tungsten to oxygen. The prior art teaches the opposite - that first tungsten is oxidized by oxygen thus providing yellow ("gold") tungsten trioxide WO_3, while the loss of oxygen from this oxide causes the change of color to blue for the form W_2O_5. Any references that teach properties of tungsten metal and its ability to change color upon exposing to oxygen according to the instant disclosure, as well as color photographs of the real experiments, will be very much appreciated.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yelena G. Gakh, Ph.D. whose telephone number is (571) 272-1257. The examiner can normally be reached on 9:30 am - 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill A. Warden can be reached on (571) 272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

12/17/2007

YELENA GAKH
PRIMARY EXAMINER